

## CLAIMS:

1. A strain gauge, comprising:  
a silicon strain sensing element for sensing  
5 strain with first and second load points and provided with  
a pair of piezo-resistors located between said load points  
such that, when said strain sensing element is subjected  
to tension or compression at said load points, a first of  
said pair of piezo-resistors is subjected to compression  
10 and a second of said pair of piezo-resistors is subjected  
to tension;  
wherein a change in relative resistance of said  
pair of piezo-resistors is induced by subjecting said  
strain sensing element to compression or tension.  
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2. A strain gauge as claimed in claim 1, wherein  
said strain sensing element comprises a curved silicon  
member.
- 20 3. A strain gauge as claimed in claim 2, wherein the  
curved singular member comprises a circular ring or  
annulus.
4. A strain gauge as claimed in claim 1, wherein the  
25 strain sensing element has a shape selected from the group  
of an ellipse, an oval, one or more curves with one or  
more straight portions; a "V" shape; or a zig-zag member.
5. A strain gauge as claimed in claim 1, wherein the  
30 strain sensing element comprises two or more load points  
and respective sets of piezo-resistors between each  
respective pair of load points.
6. A strain gauge as claimed in claim 5, wherein the  
35 strain sensing element may comprise a ring with two load  
points and two pairs of piezo-resistors.

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7. A strain gauge as claimed in claim 5, comprising three load points and three pairs of piezo-resistors.
8. A strain gauge as claimed in claim 3, comprising  
5 a plurality of load points spaced substantially equidistantly around the perimeter of said ring or annulus.
9. A strain gauge as claimed in claim 1, comprising  
10 a plurality of strain sensing elements.
10. A strain gauge as claimed in claim 9, wherein each of said strain sensing elements include at least one load point coupled to a load point of another of said  
15 strain sensing elements.
11. A strain gauge as claimed in claim 9, comprising a plurality of strain sensing elements arranged linearly, each having a load point coupled to or common with a load  
20 point of any adjacent one or more of said strain sensing elements.
12. A strain gauge as claimed in claim 1, comprising a detector responsive to changes in the relative  
25 resistance of said pair of piezo-resistors.
13. A strain gauge as claimed in claim 1, wherein said strain sensing element is provided with two pairs of piezo-resistors, arranged so as to constitute a Wheatstone  
30 Bridge.
14. A strain gauge as claimed in claim 1, wherein the strain sensing element is provided with a plurality of pairs of piezo-resistors, arranged so as to constitute a  
35 Wheatstone Bridge, and the gauge includes a current or potential sensitive device arranged to respond to changes in the relative resistance of said piezo-resistors.

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15. A strain gauge as claimed in claim 1, wherein said strain sensing elements are connected to the load points by silicon tethers.

5 16. A strain gauge incorporating a strain measuring structure fabricated in silicon to measure strain, comprising:

the strain measuring structure having a plurality of connection members adapted to connect the strain  
10 measuring structure to an external structure that in use transmit the strain in the external structure to the strain measuring structure; and

a compliant structure connected to the connection points by two or more tethers, the compliant structure  
15 being configured to translate strain at the connection points to compressive and tensile strains within the compliant structure, said compliant structure comprising piezo-resistors fabricated within the structure for the purpose of detecting compressive and tensile strain in the  
20 compliant structure.

17. A strain gauge as claimed in claim 16, wherein said piezo-resistors are fabricated in pairs so that under compressive load one is in compression and one is in  
25 tension and under extensive load the one that was in compression is under tension and the one under tension is under compression.

18. A strain gauge as claimed in claim 17, wherein  
30 piezo-resistors are arranged electronically to reduce changes in resistance due to thermal effects.

19. A strain gauge as claimed in claim 18, further comprising a base structure that does not experience  
35 strain and other piezo-resistors fabricated on parts of the base structure and can thus be used as temperature sensors.

20. A strain gauge as claimed in claim 19, wherein said other piezo-resistors are used in temperature correction for the piezo-resistors of the compliant member.

21. A strain gauge as claimed in claim 20, comprising means to apply a bias voltage between the strain sensitive piezo-resistors of the compliant member and the substrate or doped well that they are in order to control response of said strain sensitive piezo-resistors.

22. A strain gauge as claimed in claim 21, fabricated with conductive tracks to local points so that material may be electro-deposited at the local points to provide additional functionality at the local point.

23. A strain gauge as claimed in claim 22, wherein the local points are connection points and material is electro-deposited to form a raised point for bonding to an external structure for the purposes of monitoring the strain in the external structure.

24. A strain gauge as claimed in claim 22, comprising a circular silicon structure with two tethers arranged opposite each other and four piezo-resistors arranged in pairs opposite each other and substantially at right angles to the tether points and connected in a Wheatstone bridge configuration so that there is little or no change in the different voltage of the Wheatstone bridge with change in temperature and there is a change in the difference voltage of the Wheatstone bridge when the structure is under strain.

25. A strain gauge as claimed in claim 21, further comprising at least one electrical circuit fabricated on a wafer on which the strain gauge is manufactured to control

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local processing of the wafer.

26. A strain gauge as claimed in claim 25, wherein  
said at least one electrical circuit controls processing  
5 of electro-deposition.